416-5
BRITISH
4,727
(# 4,727 (3-1905))
1273

[This Drawing is a reproduction of the Original on a reduced scale.]

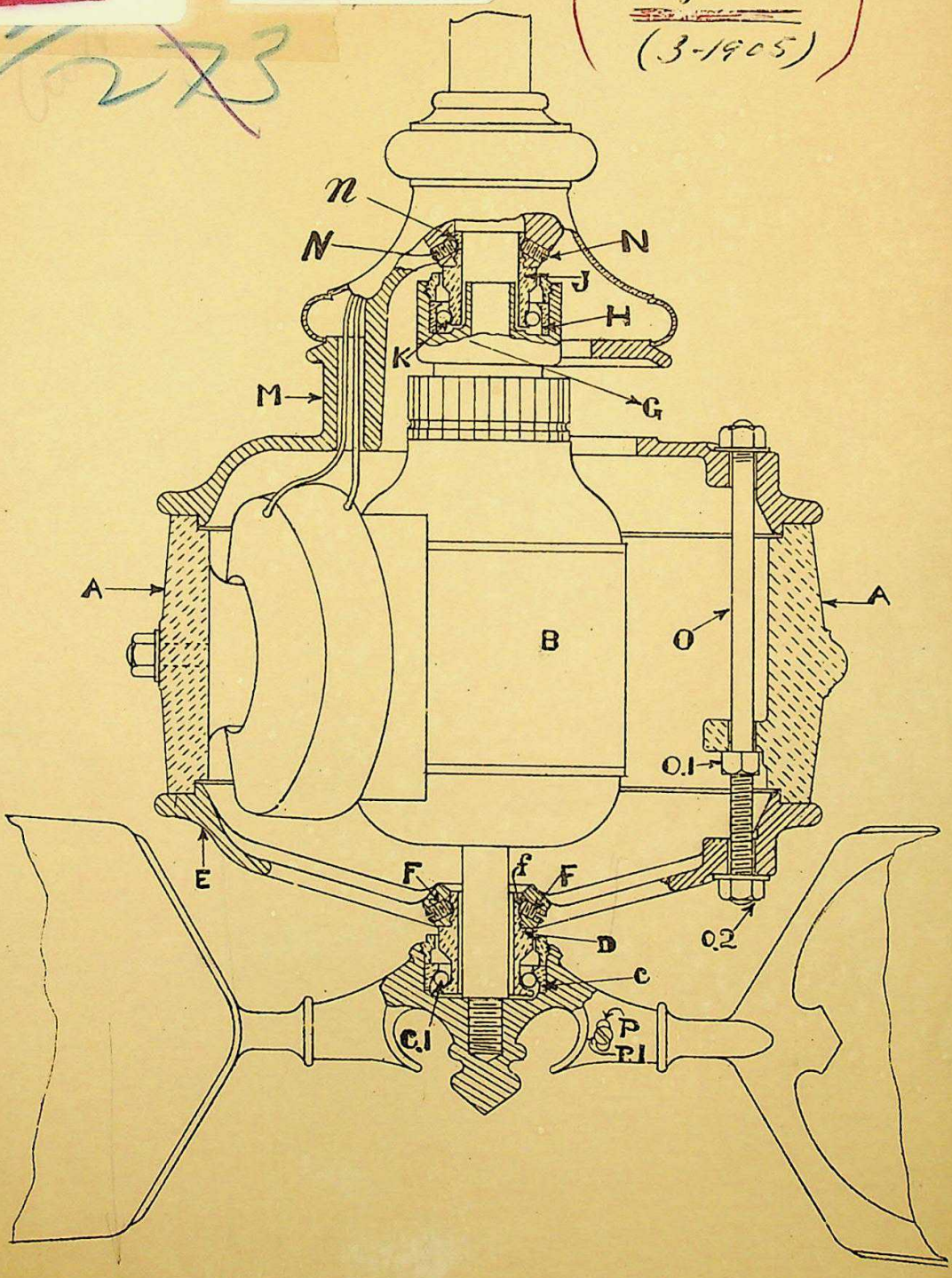

FIG. 1

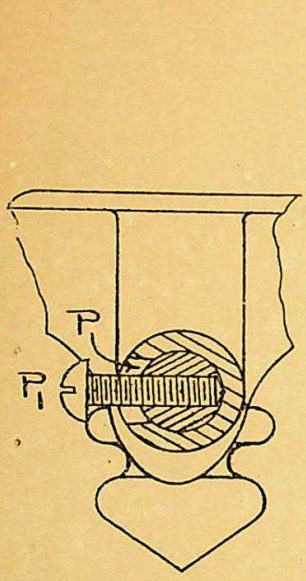

FIG 3.

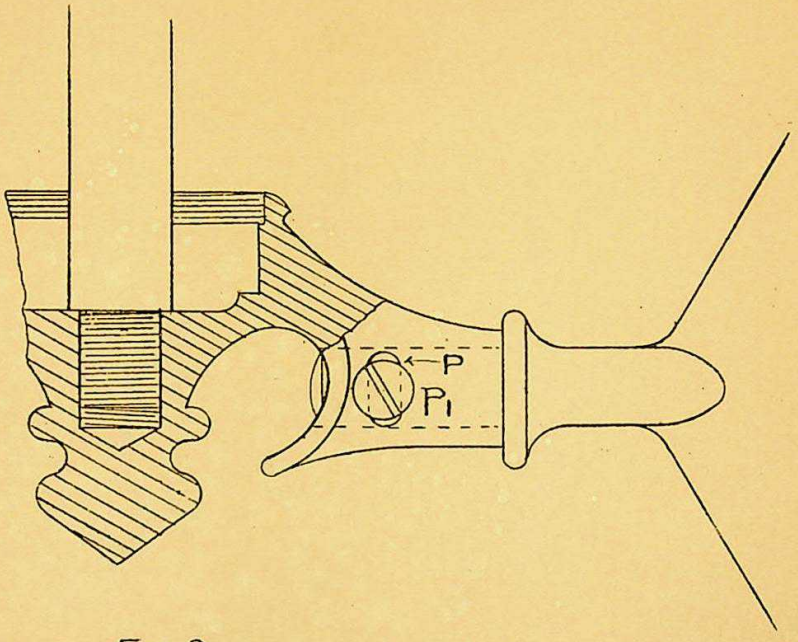

FIG 2.

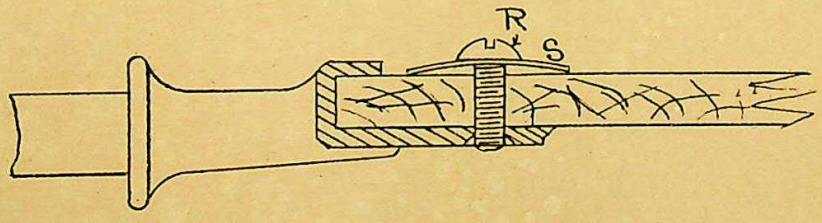

FIG 4.

4/27/1905.

N° 4727 A.D. 1905

Date of Application, 7th Mar., 1905

Complete Specification Left, 7th Sept., 1905—Accepted, 25th Jan., 1906

PROVISIONAL SPECIFICATION. DUPLICATE

Improvements in and relating to Ventilating Fans.

We, Crompton & Company Limited and Claud Crompton, Engineers, all of the Arc Works, Chelmsford in the County of Essex do hereby declare the nature of this invention to be as follows:—

Our invention relates to electrically driven ventilating fans more especially to the vertical overhead type used for circulating the air in hot climates or other places where such air circulation by mechanical means is desirable, Although we do not confine ourselves to this vertical type as many of our improvements are applicable to fans in which the spindle is not vertical. Our improvements have for their object to secure increased efficiency by reducing friction, reducing the necessity for frequent lubrication and to secure extremely silent and noiseless working. For this purpose we fit these fans with a special form of ball bearing in the following manner. These electrical ventilating fans ordinarily consist of an armature or revolving part which is caused to revolve by the action of the electrical energy supplied to the terminals of the motor. The spindle of this revolving part is fitted with a suitably formed crown or head on which any desired number of fan blades are mounted by shanks, sockets or similar mechanism. This revolving spindle passes through two ball bearings and we arrange that of these one, preferably the lower one, is devised so as to take the end downward pressure due to the weight of the armature, spindle and fan blades, whereas the other or upper bearing is arranged solely to take the side pressure necessary to maintain the spindle so as to revolve correctly in its axial position. In our invention the lower bearing is contained in a cup screwed or otherwise fixed to the lower end of the spindle. To the inside of this cup is attached the outer ball race or ring, hereafter called the lower ring, which is suitably formed and shaped so that when the balls are in position resting on an inner ball race formed on the outer portion of a sleeve, hereafter called the lower sleeve, the weight of the fan blades, revolving spindle and other driving mechanism is carried on this lower sleeve. In order to attach this lower sleeve firmly to the body of the fan we provide in the lower body framing, hereafter called the lower cover, two or more screwed pins the axes of which are inclined upwards and the points of which engage in corresponding holes bored in and at right angles to the axial line of the lower sleeve. The points of these screws therefore bear against the upper sides of these holes in the sleeve. The outer ring of this bearing is so fixed that when in place outside the lower sleeve the whole bearing forms a closed, dustproof and grease retaining chamber. The upper bearing is also contained in a cup or suitable chamber formed in the top of the part which holds the commutator or slip rings in place. This upper bearing has, as hereinbefore stated only to perform the duty of maintaining the spindle in its true axial position but it must permit of some vertical movement in order that the lower bearing can adjust its position so as to take up any wear due to the weight of the revolving parts. We attain this object by forming the bearing of an outer ring, hereafter called the upper ring, and of an inner sleeve, hereafter called the upper sleeve. One or other of these may have a cylindrical surface on which the balls revolve, therefore allowing the vertical movement of the balls above referred to in respect to this bearing. The other

part, which in some cases we find it convenient to be the sleeve and in other cases the ring has formed on it a shallow groove or ball race by which the ring of balls is retained so as to revolve in a plane at right angles to the axis. The upper sleeve can be fixed in the top cap or upper framing of the motor, hereafter called the top cover, by inclined screws in a similar manner to that previously described in the case of the lower sleeve. In order to protect the parts of the fan mechanism from foreign matter or dust we form it as follows. The upper cover consists of a bridge or arch piece, the two arms of which terminate in a disc situated in a plane at right angles to the axis of rotation, this disc being arranged to carry the terminals of the brush gear. Just above the armature and below this disc the upper frame takes the form of two tubular projections through which the conductors pass to their respective coils. In order to provide ready access for removal of the armature and revolving parts we suspend the lower cover and the magnet castings to the upper cover in the following manner. We provide two or more long bolts passing right through the above mentioned parts. The lower ends of these bolts are threaded with a screw to such a length that the magnet can be attached firmly to the upper cover by nuts screwed up against the lower side of the magnets, leaving a sufficient length of screwed bolt projecting through these nuts to pass through the lower cover and leave length for nuts below this cover so that by the removal of these lower nuts and at the same time partially unscrewing the inclined screws above mentioned which support the upper sleeve the armature with its bearings and mechanism can be allowed to drop away from the magnets leaving the magnets in position. We attach the fan blades to the revolving spindle in an improved way. The blades are attached to shanks which fit into holes drilled radially in any desired number of arms forming part of the crown or head fixed to the revolving spindle. In place of the usual method of gripping the shanks in these arms by pinching screws which are found in practice to work loose we drill and tap holes right across the shanks and fit these holes with long screws passing through slotted holes formed in the arms. By this means we greatly reduce the liability of the shank to work loose to such an extent as to become detached and thus cause an accident and we make it impossible for it to alter its angle beyond a certain and definite limit which is defined by the length of the aforesaid slot. In the case when the blades are made of wood which in extreme climatic conditions is liable to swell or contract, we fix the shanks to the blades by bolts or screws provided with spring washers under the heads arranged to adapt themselves to the variation in thickness of the wood due to climatic changes.

Dated this 28th day of February 1905.

CLAUD CROMPTON.
CROMPTON & COMPANY LIMITED.

The seal of Crompton & Company, Limited
was hereunto affixed in the presence of
B. GIBSON
CARLETON F. TUFNELL
Directors.
E. REEVES
Secretary.

COMPLETE SPECIFICATION.

Improvements in and relating to Ventilating Fans

We CROMPTON & CO LTD and CLAUD CROMPTON, Arc Works, Chelmsford in the County of Essex, do hereby declare the nature of this invention and in

what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Our invention relates to electrically driven ventilating fans, especially to the overhead type hung vertically as used for circulating the air in hot climates or in other places where such circulation is desirable, although we do not confine ourselves to this vertical type as many of our improvements are applicable to fans in which the spindle is vertical, or otherwise.

Our improvements have for their object to secure increased efficiency by reducing friction, reducing the necessity for frequent lubrication and to secure very silent and noiseless working. For this purpose we fit these fans with a special form of bearings arranged in the following manner.

Ordinarily these vertical electrical ventilating fans consist of a revolving part which is an armature caused to revolve by the electrical energy supplied to the terminals of the motor. The spindle of this revolving part is armed at its lower end with a suitably formed crown or head on to which any desired number of fan blades may be mounted by shanks, sockets or similar mechanism. In our improvements we arrange that the revolving spindle of this armature passes through two ball bearings and we arrange so that one of these, preferably the lower bearing, should be designed to take the end or downward pressure due to the weight of the armature spindle and fan blades, whereas the other upper bearing is arranged to take the side pressure only which is necessary to maintain the spindle so as to revolve correctly in its axial position.

In our invention the lower bearing is contained in a cup screwed or otherwise fixed to the lower end of the spindle. To the inside of this cup is attached the outer ball race or ring, which we hereafter call the "lower ring" and which is so formed and shaped that when the balls are in position resting on an inner ball race which is formed on the outer portion of a sleeve which we hereafter call the "lower sleeve" the weight of the fan blades, revolving spindle and other driving mechanism is carried on this lower sleeve. In order to attach this lower sleeve firmly to the body of the fan we provide in the lower body framing, hereafter called the "lower cover", two or more screwed pins the axes of which are inclined upwards and the points of which engage in corresponding holes bored in and at right angles to the axial line of the lower sleeve. The points of these screws therefore bear against the upper side of these holes in the sleeve. The outer ring of this bearing is so formed that when in place outside the lower sleeve the whole bearing forms a closed, dust proof and grease retaining chamber.

The upper bearing is also contained in a cup or suitable chamber formed in the top of the bearing which holds the commutator or slip rings in place. This upper bearing has, as hereinbefore stated, only to perform the duty of maintaining the spindle in its true axial position, but it is arranged so as to permit of some vertical movement in order that the lower bearing can adjust its position so as to take up any wear due to the weight of the revolving parts. We attain this object by forming the bearing of an outer ring, which we hereafter call the "upper ring" and of an inner sleeve, which we hereafter call the "upper sleeve". One or other of these may have a cylindrical surface in which the balls revolve therefore allowing the vertical movement in respect of this bearing which is above referred to. The other part which in some cases we find it convenient to be the sleeve and in other cases the upper ring, has formed on it a shallow groove or ball race by which the ring of balls is retained so as to revolve in a plane at right angles to the axis. This upper ring and sleeve can be fixed in the top cap or upper framing of the motor, which we hereafter call the "top cover", by inclined screws in a manner similar to that described in the case of the lower sleeve.

In order to protect the parts of the fan mechanism from foreign matter or dust we form it as follows. The upper cover consists of a bridge or arch piece

the two arms of which terminate in a disc situated in a plane at right angles to the axis of rotation, this disc being arranged to carry the terminals and brush gear. Just above the armature and below this disc the upper framing takes the form of two tubular projections through which the conductors pass to their respective terminals on the coils. In order to provide ready access for removal of the armature and revolving parts we suspend the lower cover of the magnet castings to the upper cover in the following manner. We provide two or more long bolts passing right through the two above mentioned parts. The lower ends of these bolts are threaded with a screw of such length that the magnet can be attached firmly to the upper cover by nuts screwed up against the lower side of the magnets, leaving a sufficient length of screw below, projecting through these nuts so as to pass through the lower cover and still leaving sufficient length for nuts below this cover, the object of this arrangement being that by removing these lower nuts and by partially unscrewing the inclined screws above mentioned which secure the upper sleeve, the armature with its bearings and journal mechanism can be allowed to drop away from the magnets, leaving them in position.

We attach the fan blades to the revolving spindle by an improved method. The blades are attached to shanks which fit into holes drilled radially in any desired number of arms forming part of the crown or head fixed to the lower end of the revolving spindle, but in place of the usual method of gripping the shanks in these arms by pinching screws which are found in practice to work loose, we drill and tap holes right across and through the shanks and fit these holes with long screws passing through slotted holes formed in the arms. By these slotted holes we enable angular adjustment to be made, we greatly reduce the liability of the shank to work loose to a sufficient extent so as to become detached and thus cause an accident, and we make it impossible for anyone to alter the angle more than to a predetermined extent which is defined by the length of the aforesaid slots. In such cases where we prefer to make our blades of wood, which we find in certain climatic conditions are liable to expand or contract, we fix the shanks to these blades by bolts or screws provided with spring washers under the heads, so that these spring washers can take up the variation in thickness of the wood due to these climatic changes.

In the drawings Fig. 1 shows a section side view of a fan, Fig. 2 shows a side view of a section of the blade carrier and Fig. 3 shows an end view of the blade carrier, one of the blade arms being shown in section. Fig. 4 shows details of the attachment of a wooden blade to its shank.

"A A" are the field magnets and "B" the armature of a vertical fan, with parts arranged according to our invention. The details of this consist of the field magnets as shewn in section at "A A" and the top cover shown in section at "M" and the lower cover shown in section at "E". These covers are attached to the field magnets by the vertical bolts "O", the weight of the fan being suspended from the upper cover, the field magnets being in turn suspended from the fan and attached by the nuts "O^1" and the lower cover again being held up to the field magnets by the nuts "O^2" in the manner shown in the drawing and for the object before described. To the lower cover "E" is attached the lower sleeve "D" which forms the fixed part of the lower bearing and carries the ball race and ring of balls "C^1". The lower ring "C" is attached to and revolves with the spindle and is firmly attached to it by the cup shown. The lower sleeve "D" is attached to "E" and held up by the inclined screws, which are shown at "F". The upper points of the screws bear against the depression shown in "D" at "*f*". The upper bearing shewn at "G" has the detail consisting of the upper sleeve "J" held up by inclined screws in a similar manner to the lower bearings; these screws are shewn at "N" with their upper and inner ends resting in the shallow holes, one of which is shewn at "*n*". "H" is the upper ring and "K" the

upper circle of balls. "P" shows the slotted hole in the carrier and "P1" the screw carried right through the shank, allowing of limited angular movement of the shank in relation to the carrier. Fig. 4 shows an arrangement for taking up shrinkage or alteration of thickness in a wooden blade, due to climatic causes, wherein a screw "R" bears on a spring washer "S", and these washers and screws are multiplied as the number of blades and other circumstances may render it desirable.

We are aware of the specification of Charles Richter and R. T. Eschler's Patent No. 16277 of 1901, wherein the shells of an electric traction motor are rigidly connected together by relatively long bolts and nuts and check nuts, the nuts holding the armature plates in position even whilst the check nuts which retain the outer shell have been removed.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. In a ventilating fan, the use of a lower ring and lower sleeve, an upper ring and upper sleeve, relatively supported and positioned, substantially as and for the purpose hereinbefore set forth and shown by the drawings.

2. In a ventilating fan, the use of ball bearings supported by inclined screws applied, substantially as and for the purpose set forth and shown by the drawings.

3. In a ventilating fan, the use of bolts furnished with primary nuts and secondary nuts so arranged that the bolts and primary nuts serve to retain in position the field magnets with their coils whilst the additional or secondary nuts together with the inclined screws retain in position the entire armature, its bearings and other parts thereby supported, with facility for their separate removal and replacement, without disturbance of the other parts, substantially as described and shown by the drawings.

4. In a ventilating fan apparatus, the use of ball bearings supported by inclined screws applied as set forth in Claim 2, in combination with the arrangement of bolts and nuts set forth in Claim 3, as described and shown.

5. The method of attaching the blades of a fan of the kind referred to, to the revolving spindle by the pinching screws passing across the shanks through slotted holes, so as to allow of limited angular movement for the purposes herein set forth.

6. The method of attaching wooden blades of a fan of the kind referred to, to their metal shanks by the use of spring washers, substantially as herein set forth.

Dated the 7th day of September 1905.

WM. BROOKES & SON,
55/56 Chancery Lane, London.
Agents for the Applicants.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1906.